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SAFETY EDUCATION

IN

INDUSTRIAL SCHOOL SHOPS

BULLETIN 332
1942

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF PUBLIC INSTRUCTION
HARRISBURG

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SAFETY EDUCATION
IN
INDUSTRIAL SCHOOL SHOPS

A Study of Accidents in School Shops,
Their Causes, and Recommendations
for Approved Procedures

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FOREWORD

THIS BULLETIN is a revision of *Safety Education in Industrial School Shops,* published in 1938. It is a condensation of the recommendations and findings of a study made of school shop accidents for a period of one year. The statistical information resulting from this study has been omitted from this revised publication.

The increasing interest in safety education of all types is indicative of the present-day attitude of leaders in school, business, industry, and other groups. Planned programs of safety in industry and in school shops are yielding valuable results in the reduction of the number of accidents and in making the workers safety conscious.

This bulletin was prepared by Paul L. Cressman, Director of the Bureau of Instruction, with the cooperation and assistance of many schoolmen throughout the Commonwealth of Pennsylvania.

The material is designed to be helpful to teachers engaged in shop work and to students qualified for industrial teachers.

This revised edition is prepared primarily for the large number of new teachers of national defense classes in the public schools and in industry. The industrial teacher holds a key position in the development of safety education for workers in industry.

Francis B. Haas

Superintendent of Public Instruction

June, 1942

leaders in schools have been willing to accept this as a cause. Carelessness reflects an improper attitude toward safety. Somehow safety education was not effective, and the question to be answered was—Why was it not effective?

Students of this problem made a deeper search for causes of accidents which take us beyond the mechanical elements and the common human elements. A study of the health, worry, strain, and the physical condition of the worker was undertaken in numerous places. As an example of this, the National Research Council, conducting an inquiry into the "human equation" as a cause of automobile accidents, discovered that many people who think they are properly equipped for safe driving actually have serious physical impairments they know nothing about. Dr. Alvah R. Lauer, in charge of the investigation, found that particularly in matters of vision there were many unsuspected deficiencies commonly ignored.

Among these, frequent causes of accidents were found to be improper depth perception, contracted field of vision, ocular dominance (one eye stronger than the other), color blindness, and weak glare resistance. Other unusual causes are weakness of grip in steering and susceptibility to shock from sudden noises. Doctor Lauer has invented unique mechanical devices to test these factors, and he hopes soon to have a completely accurate method of determining whether a driver can meet standard requirements for safety.

At a safety education conference at New York University in January, 1942, Dean Ned Dearborn in a banquet introductory remark quoted from the U. S. Census Bureau Reports as follows: "In 1941 there were 9,500,000 American citizens injured through accidents. Of this number 101,000 were killed, 350,000 others suffered some form of permanent disability, 460,000,000 man-days were lost, and the estimated economic loss to the nation was $3,800,000,000. Accidents in the United States is the fifth largest cause of death. There are eleven people killed every hour and forty people every hour receive some form of permanent disability. The man-days lost is equivalent to the man-days required to build forty-five battleships or 75,000 fighter planes, according to an estimate used in a public statement made by Secretary of the Navy Knox."

Safety Education Succeeds

The National Safety Council in its 1933 edition of "Accident Facts," shows that accidents resulting in injury and death occur much less frequently to students engaged in school activities than to those engaged in non-school activities. This also includes injuries and fatalities in athletics.

There is considerable evidence that improvement is noted as a result of definite safety instruction, and through the furnishing of safety equipment. An example of this is noted by O. H. Turner, Superintendent of the David Rankin Jr. School of Mechanical Trades, St. Louis, Missouri, in a report of a study on eye injury cases:

Year	Eye Cases
1926-27	16
1927-28	5
1928-29	4
1929-30	8
1930-31	5

Superintendent Turner makes the following comment in connection with this study:[1]

> "It is not always an easy matter to convince shop instructors that all of the measures advocated by safety experts are necessary. And some of these measures may be extreme and unreasonable. But when many of the largest and most successful industrial organizations adopt them, the instructors are more inclined to give heed. A visit to the Pullman Company plant in St. Louis by our machine-shop teachers a few years ago thoroughly convinced them that we should make a more general use of goggles* in our school shops. This company requires all its employes to wear goggles at all times while in their shops whether actually working or not. Even visitors passing through the shops are required to wear goggles."

We should be further encouraged in a safety education program when we note the success of the schoolboy patrols. Reports indicate that accident deaths in the five and fourteen age group decreased substantially in 1932 and in 1933, while those under five years of age remained the same. Credit for this reduction is ascribed to safety education and safety organizations such as schoolboy patrols.

The teachers in New York City are given a twenty-week course in accident prevention, designed to acquaint them with the facts about the accident situation in their city, and to suggest various means of teaching safety in the classroom. According to a statement in "The Forecast," the sponsors of the course are the school system, the police department, the homes, the parents' associations, and all others interested in street safety.

The police are constantly trying to curb the dangerous practice of stealing rides or hitching; in many cases the young offenders are taken in charge by welfare officers of the precincts, who notify the parents and seek their help in discouraging this practice. Every effort is being made to interest the children in wholesome recreational activities as an antidote to the kind of play that may lead to accidents.

The accident-reporting system is the basis of the prevention work. If the accident is reported, investigations can be made so that preventive measures can be taken.

Safety Education Opportunities

With the enrollment of several million persons in vocational classes in America, and with the millions of boys in industrial arts classes in the junior high school grades—what a responsibility! What a challenge!

[1] An unpublished manuscript.

* Goggles were provided students in machine shop, plumbing shop, and automobile shop.

The Shop Teacher

It should be said to the credit of the shop teachers that they are emphasizing safety education and practice it in an ever-increasing degree. This increase is probably about at the same rate that working men in industry reflect improvement in safety practices, and all this is probably the result of the emphasis given safety in recent years.

Many shop teachers reflect safety in practice in all of their work. Their students learn from example more than from precept. This is a most effective way of teaching. They also devote time to teaching safe ways of doing things, such as, what precautions to take, and how to cooperate in a school group in the interest of safety.

Unfortunately, even now one can hear a few shop teachers make such remarks as these: That guard is more nuisance than it is worth; When I worked in industry we would not use guards; Every man should carry the sign of his trade—look at this stub of a finger; In the teacher-training school the shop teachers did not require us to use guards nor take safety precautions.

Fortunately these teachers are becoming fewer in number, but what are we going to do with this type who remain even a year longer? How great will be the effect of their unsafe attitude and unsafe practices on society? How great will be the harvest? What can be done about it?

The shop teacher who is continuing his professional education has taken the attitude of a research worker. He has set up a plan for keeping records of shop accidents to determine causes of accidents and points of danger for the purpose of seeking remedies. We need to encourage all shop teachers to study this problem from this angle.

Then, too, teachers are frequently given large classes. It is not infrequent that they have more students than their equipment and facilities provide locations. This creates a real problem even for the best teachers. The teacher is also confronted with many other problems, such as, seeing that all mechanical safety devices are constantly in place, that the light is adequate, that there is good housekeeping, and, above all, that students are instructed in safe ways of doing things.

The School District Officials

The board of education, the superintendent of schools, the assistant superintendent, the director of vocational education, and the principal have in recent years become interested in all phases of safety education. Each year records an increase in the ranks of school officials who are interested in setting up programs of safety education. They are no longer content to let safety education be incidental to the rest of the curriculum. The plans[3] followed in various school districts differ considerably, but at this time that is not of major importance. The important

[3] Idabelle Stevenson, "General Account of Prevalent Types of Administration." National Society for the Study of Education, The Present Status of Safety Education. Part I, Twenty-fifth Yearbook. Bloomington: Public School Publishing Company, 1926.

part is—does the plan work and does the staff actually work seriously at this task? Is the district getting results?

Since safety lends itself readily to studies, tables, tabulation, etc., and because of annoying school accident situations that have developed in almost every community, school officials are now asking that reports of all accidents be sent to the central office. In an increasing number of districts the data is being tabulated and comparisons are being made between teachers, schools, and previous yearly records. There is a gradual acceptance of a common form for reporting. A number of districts have adopted the form used to secure the information for this study. Fortunately, the persons writing on safety and developing safety materials, are almost, without exception, willing and pleased to have others use their forms and materials in whole or in part. They do this for the cause of safety education.

The school districts have the problem of purchasing properly guarded equipment and having it installed properly. The standards of proper guards for machines ought at least to meet the standards of Departments of Labor and Industry of the respective states. School officials will do well to consult representatives of Labor and Industry Departments to be certain their equipment measures up to the safety standards in every respect.

School officials need also to inquire into the lighting, the arrangement of equipment, and auxiliary rooms which contribute to safe situations. They also need to be concerned with the physical conditions of the students, such as, health, sight, etc.

School shops are exceedingly dangerous places to over-crowd[4] with students.

Teacher-Preparation

The opportunity and responsibility that teacher-preparation institutions have in promoting safety education can be securely over-estimated. Fortunately, this opportunity is being embraced by all of these institutions. The complete cooperation of all the members of the faculties in these colleges and universities is needed. At this time this complete coopration of all members in all faculties is not realized. What steps should be taken, particularly with institutions preparing industrial arts teachers, so that they will lead in the most modern and approved practices of safety?

The colleges and universities preparing tradesmen to become trade teachers have an even more difficult task. The tradesmen have learned their trades in industry; habits of work and safety practices, or the lack of them, are fixed to a marked degree. How can all these prospective trade teachers be induced to adopt the most improved safety practices?

The teacher preparation, on both an industrial arts and vocational basis, has demonstrated that prospective teachers, and those taking training while in service, will accept the challenge that safety education presents.

[4] By over-crowding is meant more students than there is equipment providing for a working location for each boy, and also more students than the teacher can instruct safely.

Men in Industry

In every age we have had the safe and unsafe worker. It must be conceded that because of improved machines built to eliminate accident hazard, and equipped with safety guards, and because of the safety education program conducted in industry today, the workers are much more safety-minded than they were a decade or more ago.

The tradesmen from industry who qualified to teach, in many cases, reflect an attitude toward safety which many of the tradesmen held in their day when they worked in industry, rather than the attitude of modern industrial workers. This has been a problem with which alert directors of vocational education have been dealing during the past few years with reasonably gratifying results. More needs to be done along this same line so that one generation of workers does not hinder another generation in making progress, growth, and improvement by insisting that their way of doing things is the best way or the only way. An attitude of alertness to discover new and improved ways of doing things, particularly from a safety standpoint, should continue to be cultivated.

The industrial teachers of today can profit greatly by keeping in touch with safety programs and practices in industry. Industry is concerned with safety education. It is, however, even more concerned with the elimination of the accident hazards. This is apparent particularly in the engineering revision that has been taking place in equipment.

Manufacturers of Equipment

Machines today are designed not alone with labor-saving devices but also with a view of eliminating hazards. Belts, gears, wheels, etc., are enclosed. The square head cutter on the jointer gave way to the cylinder-head cutter, thus reducing at least the degree of the damage in the event of accident. The paper cutter of modern type requires both hands on controls for operating to insure complete safety for the fingers of the operator. All groups look to the engineer in industry to continue to make machines practically "fool-proof" so far as hazards are concerned. He has done much toward this end. There is much more to be done.

The State Departments

The state Departments of Labor and Industry in the several states have set up safety standards and regulations. They have been a very potent force in the safety movement.

The regulations governing guards and safety measures generally, were drawn up cooperatively with representatives of industry—employers and employes.

The regulations were designed to correct hazards or unwise practices. These hazards were noted from studies made from accident reports sent to these Departments.

The Public Concerned with Problem

The problem of safety concerns everyone. We are all interested in conserving human life and in avoiding painful experiences, waste, and

economic loss. Everyone is concerned with finding remedies. The schools have a remarkable opportunity to make a contribution in the interest of safety. The public wants them to make this contribution and the schools are rapidly adjusting themselves to measure up to this expectation.

CHAPTER III

RECOMMENDATIONS FOR A SAFETY EDUCATION PROGRAM

The Basis of Recommendations

Recommendations for a corrective program should be based, as far as possible, on successful accomplishment, and upon a critical evaluation of changing conditions. Plans, procedures, and methods that have been tried out and yielded satisfactory results might well form the basis for recommendations. Recommendations should serve the needs of the situation, at least until better plans, procedures, or methods are discovered or evolved.

New situations and cases will arise for which no known satisfactory solutions have as yet been found. In such cases experience in dealing with problems somewhat akin should be given consideration in setting up tentative solutions.

These recommendations are based largely on tested experience in dealing with the problems involved. The satisfactory experiences of those who have made safety problems a special study were drawn upon largely in preparing the safety recommendations in this chapter. The success of most of these recommendations have been observed by the writer.

Consent to use these recommendations and suggestions has been very readily granted by each school district, department, or person concerned. Safety leaders regard it a privilege to make a contribution to the cause of accident prevention.

The Sources of the Recommendations

The source of the recommendations were secured largely from:

(1) Harrisburg: *Safe Practices—Recommendations.* The Department of Labor and Industry, Commonwealth of Pennsylvania.

(2) Detroit: *Handbook of Safety Regulations.* Board of Education, City of Detroit, 1933.

(3) Lancaster: *Safety Standards and Recommendations for School Shops.* School District of Lancaster, 1934.

(4) Philadelphia: *Safety Standards and Recommendations for Use of Teachers of Shopwork.* Philadelphia Public Schools, Philadelphia, 1930.

(5) Pittsburgh: *Safety Requirements for Shops.* Pittsburgh Public Schools, Pittsburgh, 1933.

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Most of the safety measures suggested in this chapter were carefully selected from the foregoing publications, thus adding the weight of tested experience to this study. In certain cases most of the pamphlets listed above contained suggested regulations. In such cases critical selections were made for the most appropriate safety measures.

General Safety Recommendations

Anger

It is unsafe to permit any angry person to operate a dangerous machine or work in a hazardous location.

Ask for Information

"When in doubt concerning the work with power machinery ask for foreman or instructor." (2)[1]

Belts

"Never attempt to stop a machine by grabbing a belt. When replacing a belt, stop the machine and adjust it on the driver pulley first. When shifting overhead belts always use a stick reaching nearly to the floor. If an overhead belt is caught and begins to wind around a shaft, get away. Shut off the power immediately. Metal belt fasteners must never be used on hand shifted belts. In shifting lathe belts by hand always use the palm, with thumb and fingers extended." (2)

Burred Tools

"No tools or stencils with mushroomed heads should be permitted in service. This applies to tools owned by the workers themselves as well as company tools." (1)

Caps

"Persons working in shops around machinery which presents a hair-catching hazard should wear caps or other types of head covering. Caps should also be worn where there is danger of the hair catching fire. Caps with metal buttons or metal visors should not be worn around electrical hazards. Women working about machines should wear caps at all times." (1)

Checking Equipment

"When accepting for use any equipment examine it carefully and report any breaks or defects and thereby avoid possible accidents." (2)

Cleaning Up

"All rags, waste paper, bits of broken lumber, excelsior, packing materials, and other inflammable debris should be cleaned up daily from under work-benches, from behind machines, and from all other spaces. Such materials should be kept in suitably covered containers. This would tend to reduce the amount to be cleaned up each day." (1)

"In all cases before students are permitted to clean up their machines the main power switch should be thrown out and locked." (2)

[1] The numbers throughout this chapter refer to the pamphlets listed under "The Source of the Recommendations."

Courtesy

"Students should treat their shop mates with courtesy and work in harmony with them." (2)

Crowding

Crowded conditions should be avoided. Crowding may be due to over-sized classes, lack of equipment, or to too limited floor area. Each student should have a working location. A minimum of at least forty square feet per student is usually needed in the average shop. There may be other factors to consider under crowded conditions.

Defective Machines and Tools

Avoid using broken tools, splintered handles, improperly tempered tools, mushroomed tools, improperly designed equipment, damaged or rotted ladders, worn or rotted rope, etc.

Dust

"Dry sweeping in workrooms should be permitted only where there is no dust hazard or where the nature of the work performed precludes the use of other methods; otherwise all floors should be sprinkled with water before sweeping. The use of disinfecting solutions in the water is recommended. The practice of using damp sawdust or other wetted materials is acceptable in lieu of sprinkling water, especially around electric equipment where the use of water would tend to create a hazzard." (1)

Extension Cords

"Separable connections should be provided on all extension cords for drills, drop lights, etc. Only super-service, heavy rubber covered cord should be used for all extensions. Extension cords should only be connected to wall outlets, never to lighting circuits. Whenever possible avoid the use of extension cords by arranging for permanent electrical installations." (2)

Falls

Avoid using defective ladders and defective ropes. Set ladders at proper angles with a sure footing. Guard rails and foot boards should be provided for elevated positions in accordance with standards set up by the Department of Labor and Industry.[2]

Falling Objects

"Piling of materials should at all times be carefully done, being sure at all times to maintain the balance of the pile. Removing objects from a pile requires the same caution in maintaining balance to the remainder of the pile.

"Other contributory causes to falling objects follow:

1. Objects falling from trucks, wagons, and cars which are not properly blocked or tied.
2. Tipping of hand trucks moved on or off elevators.

[2] *Railings, Toe Boards, Open-sided Floors, Platforms and Runways.* Harrisburg: Department of Labor and Industry.

3. Transferring of objects by cranes, derricks, or hoists. Proper selection of chains, rope-slings, hooks, and other equipment is important.
4. During a lift everyone must keep out from under the object being lifted.
5. Jobs rolling to the floor from benches. Such jobs should be properly blocked.
6. Where blocks, jacks, and horses of insufficient strength are used.
7. Throwing tools or materials to a fellow workman. They should always be handed to him or, if that is not possible, they should be placed in a suitable container which can be raised or lowered by a rope.
8. Leaving tools on the edge of high places where vibration or accidental striking may send them on their way to probable injury to some person." (3)

Falling Tools

"Workmen working at elevated levels should not strew their tools about promiscuously. They should be carried in tool belts or kept in tool boxes when not in actual use. The practice of throwing tools from one level to another should be discouraged. They should be raised or lowered with light ropes or passed from hand to hand. The practice of working above unsheltered workmen should be actively discouraged at all times.

"Never pile or lean tools or materials against anything. They may fall or be knocked down and injure someone." (1)

Feeding Stock Too Fast

"Improper speeds and feeds of machines may be dealt with by posting conspicuously speed and feed charts and requiring the pupil to use only the speed or feed indicated for the work he has in hand." (3)

Footwear

"Shoes with Good Soles. For normal shop wear shoes with unbroken soles and low or medium height broad heels should be used. Where there is a possibility of heavy objects dropping on the feet, the toes should be boxed or reinforced." (1)

"Special Shoes. For hazardous occupations such as the handling of hot metal, acids, caustics, electric current, and hot substances, or other objects offering a burning hazard to the feet, specially adapted types of footwear are available and should be worn." (1)

Guards

"No person or persons shall remove or make ineffective any safeguard, safety appliance, or device attached to machinery or guarding a hazardous condition except for the purpose of immediately making repairs or adjustments; and any person or persons who remove or make ineffective any such safeguard, safety appliance or device, for repairs or adjustments, shall replace the same or its equal immediately upon the completion of such repairs or adjustments. (Section II, General Factory Laws.) (1)

Goggles

"Goggles or other forms of head and eye protection should be worn during the performance of all operations involving hazard to the head or eyes." (4)

"Goggles must be worn while working at grinders, shapers, and while welding, chipping, pouring metal, and when lighting furnaces, even though the operation may take only a moment. Flying chips from cutting tools and sparks from grinding operations have caused many serious injuries." (2)

Handling Stock

Special care should be taken in handling stock. Splinters and metal-cut accidents are numerous. These are due largely to sliding stock through hands or to failing to fasten stock securely while working on the same.

Hasty Work

Haste should be avoided in school shops. Special warning safety precautions should be taken and haste avoided the last month of each semester when accidents are most numerous.

Hand Tools

a. Adjustable wrenches should always be used with the jaws facing the direction of pull thereby eliminating slippage which in turn produces the skinning or mashing of knuckles.
b. Correct tools for every job should always be used, as per the following suggestions:
    1. Machinist hammers should not be used as carpenters hammers and vice versa.
    2. Screw drivers should not be used as or for chisels.
    3. Wrenches should not be used for hammers.
    4. Pliers should not be used where a wrench is needed.
    5. Soft metal hammers of lead, rawhide or copper should be used on tempered tools such as drills, reamers, jigs, and fixtures, thereby preventing possible injury from flying chips of hard steel.
    6. Pliers, taped or not taped, should never be used on live electric circuits.
    7. Tongs or special holders should be used when holding bull chisels.
c. When finished using hand tools always put them in their proper places. Never leave them lying around where someone can trip over them or on a shelf where they can fall and injure someone.
d. Hand tools should always be kept in the best of condition as follows:
    1. Mushroom heads on cold chisels and hammers should be dressed immediately.
    2. Hammers must have good handles and tight heads at all times.
    3. Pipe wrenches should always have sharp jaws.

4. Tools having slivered or splintered handles should be repaired at once with new or smooth handles.
5. Screw drivers and files should have well-kept handles." (3)

Handles

"Wooden handles of hand tools should be of the best straight-grained material.

"Wooden handles which have been excessively burned or worn, or which are cracked or badly splintered should be removed from service." (1)

Housekeeping

"Placing of Tools. Tools laid aside temporarily shall be placed in positions which will not endanger other persons in the shop. (2)

"Placing of Materials. Do not store material or tools on the floor, nor temporarily leave them on the floor to cause stumbling hazards, nor on unguarded overhead trestles or platforms from which they might fall. (2)

"Removal of Chips. Chips should be removed from the machine with a brush or hook. Do not use your fingers, waste, or cloth. (2)

"Oily Waste and Rags. Put oily waste or rags in the closed metal container waste cans provided for the purpose to avoid fire hazards. (2)

"Cleanliness. Shavings and waste material are to be removed from the school shops and laboratories at the close of each day's session. Teachers can cooperate with janitors by keeping all cabinets, shelves, tables, desks, and corners clean. Piling stock on the floor should be avoided." (2)

Horseplay

Fooling (horseplay) in shops should be eliminated.

Illumination

Sufficient, non-glaring light should be furnished in all working areas, in stairways, and storage spaces. Light should be placed particularly carefully at machines.

Inattention

"When a learner is operating any machine, conversation between the learner and any other person should be prohibited. If instructions are necessary, the machine should be stopped." (4)

Keen-Edged or Pointed Tools

"Direction of Cut. Care should be exercised in the use of adzes or draw knives to insure that no part of the body is close enough to the point being worked on to be endangered by a slip of the tools. When cutting with a hand knife, the direction of the cut should always be away from the body. (1)

"Manner of Carrying. Keen edged or pointed tools, such as axes, hatchets, adzes, saws, knives, chisels, bits, lineman climbers, or similar tools should not be carried in a manner which endangers the bearer or persons passing him. Do not carry a long screw driver or other pointed tool projecting from your pocket." (1)

Leggings

"Protective leg covering (clothing or devices) should be worn when handling hot metal, acids, caustics, or other hot or cold substances offering a burning or scalding hazard. The material of which they are made should be determined by the nature of the product being handled. Full length leg or body protection should be used if the nature of the operation presents a full length leg or body hazard.

"Fastenings. The method of fastening all-protective leg covering should permit of instantaneous removal." (1)

Leaning on Machines

"Do not lean on a machine while it is in operation. Keep at a safe distance from all moving parts." (2)

Loose Clothing

"Superfluous material and loose fitting clothing should be avoided in the presence of a hazard from moving machine parts. Excessively wide or long aprons should not be worn around moving machinery. Aprons should never be tied on with wire and should be but lightly secured, so that they can be easily torn loose by hand. In the presence of a fire hazard aprons of nonflammable material should be used. (1)

"Articles of wearing apparel or personal adornment, including spectacle rims, collars, eye shades, or cap visors, composed principally of some form of cellulose should not be worn in the presence of a spark or fire hazard." (1)

Machine Out of Order

"Lock the switch or hang an "out of order" sign on a machine that is out of order." (2)

Matches

"Matches shall be stored in closed glass, earthenware, or metal containers and be in the personal charge of the teacher. Only safety type matches shall be used." (2)

Obsolete Equipment

"Obsolete equipment which cannot be brought up to present safety standards should be discarded." (3)

Oiling Moving Machinery

Avoid oiling machinery while it is in motion.

Oily Waste

"Grease, oil, or paint soaked rags, waste, or other materials of like character, many of which are subject to spontaneous combusion, shall be kept in approved self-closing metal receptacles. These receptacles shall be kept safely clear of combustible surroundings and their contents shall be safely disposed of at least once each day." (2)

Operating a Machine

"When a student operates any of these machines, no other person but the instructor shall be allowed inside the line. No one outside the line shall be allowed to talk to the student operating the machine, except in case of emergencies. The helper to the boy feeding a print press is an exception to the rule." (2)

Operating Zones

Safety zones for the operator should be established around each machine operator's location. Painted lines on the floor prove satisfactory. Operator's spaces painted with a paint including an emery grit are very satisfactory. Corrugated rubber mats if fastened securely to the floor at the operator's position provide an added safety measure.

Permission to Operate Machines

"Never operate a machine unless permission has been given by the instructor." (2)

Piling Safely

"Piling. All material needing to be piled should be carefully piled to prevent falling. When piling material near travel-ways, special care should be exercised to eliminate any possible hazard from piles being knocked over. Piles should not extend into travel-ways. (1)

"Light. Piles of material should not interfere with the adequate distribution of natural or artificial light. (See Regulations for Industrial Lighting for intensities required.) (1)

"Height and Extent. Material should not be piled to a height which would render the pile unstable or which would interfere with the operation of a sprinkler system. Piles should not be placed so close to equipment as to hinder operators in the proper operation of their machines or expose them to hazard from slides or falls of material. (1)

"Binding. Wherever possible the stability of piles should be increased by piling alternate layers crosswise, or, in the case of long piles, by crisscrossing at the ends or using binder strips. (1)

"Round Objects. Should be carefully blocked at the center and at both ends to prevent spreading." (1)

Projecting Set Screws

"Avoid use of projecting set screw heads on revolving parts." (2)

Proper Footing

"When working around any machine, be sure good footing is provided." (2)

Pouring Metal

"Approved leggings, shoes, and goggles must be worn during pouring operations in the foundry, by all persons who are pouring or otherwise exposed to the danger of burns from the spilling or splattering of molten metal. Be sure that the mould is perfectly dry, to avoid spattering." (2)

Safety Habits

"Students should endeavor to acquire habits of caution for their own protection and that of their shop mates. They should cultivate careful, thoughtful, and deliberate habits of work and develop a 'safety conscious' attitude of mind." (2)

Safety Zones

(See operating zones.)

Sleeves Rolled

"Students are to have sleeves rolled to the elbows and loose hanging ties so arranged as to prevent entanglement while working on revolving machines." (2)

Sharp-Edged Scrap

"All objects with sharp edges, such as scraps of glass, tin, sheet metal, and the like should not be thrown into the wastebasket or other containers ordinarily used for other debris, but should be placed in separate containers. Neither should such material be permitted to remain on floors except during operations normally resulting in its creation. In the latter case, containers should be provided to catch such waste material as it drops from machines or benches and the floors should be frequently cleaned up each day to prevent undue accumulations." (1)

Sharp Tools

One of the safety measures to be adopted in all shops should be to keep all tools sharp. Dull tools are dangerous. This is particularly true of dull circular saws.

Slipping Hazards

"Puddles or drippings of oil, grease, water, or other liquids should be rendered harmless by mopping up and strewing sand or sawdust on the floor until the floor is dry. Oil-soaked sawdust should be disposed of promptly to prevent spontaneous ignition. Drippings on floors should be prevented by eliminating the cause or by placing drip pans in position until the cause has been eliminated."

Supervision

"Proper supervision is probably the best accident preventative at the command of the shop teacher. With the proper shop organization the instructor should be able to spend nearly all of his time moving about the shop, constantly observing the progress of all operations, both from the standpoint of proficiency and safety. Proper supervision is not achieved from a desk." (2)

Stand Clear

"Form the habit of never standing in line with swiftly revolving parts, such as grinding wheels, pulleys, saws, and jointers." (2)

Starting Machines

"Before throwing on power always examine carefully, to make sure every part is in working order. If possible move a machine by hand to be sure all moving parts are free before throwing on the power." (2)

Stop

"Always stop a machine before cleaning, oiling, adjusting, or setting cutting tools." (2)

Stock Held Insecurely

Stock should be fastened in the vise securely or clamped down to avoid a large number of accident injuries.

Stock Too Short

Avoid machining short stock. Let each shop establish a minimum length. Twelve inches is a commonly accepted minimum length.

Storing Tools

"No hand tools should be permitted to lie on the floor, ground or working platform when not in use for any length of time. They should be kept in the proper receptacles or storage places. Axes, hatchets, adzes, or knives should be placed in receptacles providd for the purposes. For temporary purposes only, the cutting edge of the tool should be driven into a flat in places where persons will not trip over them or else lodge vertically in corners or racks where they timber far enough to hold the tool in an upright position." (1)

Striking Hand Tools

"Hand tools should always be struck with wooden, soft metal, rawhide, or rubber hammers or mallets if the part receiving the blow is case hardened or tempered. Such hammers or mallets should also be used where inflammable or explosive gases or vapors are present. Sheets of brass or other soft metal may be used to receive blows, but should not be battered to an extent which would create a hazard of flying particles. Hand striking tools which show any signs of cracking should be removed immediately from service.

"Hammers and hatchets with corrugated driving faces for driving flat-headed nails should not be used for driving brads or nails with rounded heads, because of the increased hazard of flying nails.

"Do not use a machinist's hammer for driving nails, and do not use a carpenter's hammer for machine work." (1)

Taking Chances

Chance-taking results frequently in accidents. It should be avoided.

Teacher Present

"Machines should be operated only when the teacher is in the shop. Main switches in the shop should be pulled and door on panel box locked whenever the teacher leaves the shop." (4)

Travel Zones

"Loose-board material and other objects or materials should not be permitted to remain strewn haphazardly on the floor or ground in places where persons have to walk or work, but should be piled up neatly. No loose material of any description should be permitted to remain unsecured in any overhead position." (1)

"Aisles should be established by painting clear white lines indicating their location and keeping these aisles clear of any and all material or equipment." (3)

Tired and Mentally Fatigued

Ill health, worry, lack of sleep, dissipation, over-work, etc., cause sluggishness. Those afflicted cannot give strict attention to their work.

Turning on Power

"Instructors will personally see that the power switch at every machine is released before the main power supply is turned on. When starting power machinery or throwing on electrical current, instructors should always caution students to 'stand clear of machines'." (2)

Undivided Attention

"When operating a machine students should give their undivided attention to the work." (2)

Unsafe Processes

Certain processes are known to be dangerous or risky. These should be avoided.

Ventilation

Improper ventilation, fumes, and suffocating gases need to be eliminated. This needs to be cared for particularly in auto shops, foundries, etc.

Worry

"Worry prior to an accident is extremely difficult to detect but close observation of pupils at the time assignments are made is essential. Having determined that a pupil is worrying, two courses are open to the instructor: first, if possible remove the cause, and second, if this is not possible then remove the pupil from any dangerous contacts." (3)

Wrenches

"All wrenches should properly fit the nuts, bolts, or other objects they are used to turn. Except when closed wrenches are used, the practice of using thin pieces of material as shims to make oversize wrench fit should not be permitted. Always put a wrench on the right way so that you do not spread the jaws and cause it to slip.

"Wrenches should not be used as hammers." (1)

Specific Shop Safety Recommendations

Automotive Shop[3]

Removal of Gasoline

All gasoline must be drained off before an automobile is brought into the shop, except in cases where special permission has been granted.

Draining Carburetor

The carburetor of an engine must be run dry outside the building before the car is brought into the shop.

Running an Engine

Running a gasoline engine inside a school shop is not to be allowed under any conditions, except when special permission has been given by the fire marshal concerning such shops as have specially constructed vents to the outside of the building.

Storage of Gasoline

The storage of only one gallon of gasoline in an approved container is allowed in an auto shop.

Disconnect Battery

Before working on the power plant of a car, disconnect the battery and insulate connections.

Fire Protection

In case of fire about a machine or from spilled gasoline, smother out the flames with the fire extinguisher provided. If no extinguisher is at hand, use wet rags or wet sand.

Charging Battery

Before taking battery off "charge," throw off charger switch and then disconnect battery.

Burns from Engine

Many severe accidents result from contact with exhaust pipes, manifolds, and other portions of engine while hot.

Hot Water and Steam

Use great care in draining radiators, removing radiator caps, and removing hose connections to avoid burns from hot water and steam.

Grease and Oil

Keep the floor free from grease and oil.

Creepers

Keep creepers off the floor when not in actual use to prevent accidental tripping.

[3] Many of the general safety recommendations also apply to the automotive shop as well. Here are listed those recommendations applying only to automotive shops. All of these recommendations appear in *Handbook of Safety Regulations*. Board of Education, City of Detroit, 1933.

Blocking

When removing and replacing axles, frames, springs, and such units, a jack of an approved type should be used and the machine should be properly blocked. The blocking must be carefully inspected by the instructor.

Mounting

When working on heavy units see that they are securely mounted on substantial blocks or horses.

Chain Hoists

Be sure that all chain hoists are securely fastened to a substantial horse or other fixture.

Cranking

In cranking an automobile engine—

1. See that the engine is in neutral and the spark retarded.
2. Stand a little back from the crank in an easy position.
3. Avoid straightening the arm at the elbow.
4. Keep the thumb on the handle of the crank next to the forefinger.
5. Avoid spinning the motor.

Electrical Shops and Laroratories[4]

1. No electrical apparatus is to be worked "HOT" unless under personal supervision of the instructor.
2. All test lamps must be 220 volt.
3. Fans, projecting set screws, and gears on motors under test must be adequately guarded before power is turned on.
4. Moisture on molten metal will cause a violent explosion, which might result in the loss of eyes. Never pour any metal until everything has been inspected by the teacher, and then only under his immediate supervision.
5. Do not leave a hot iron or soldering copper where someone may pick it up or step on it. Mark it "HOT" with chalk if it cannot be put out of harm's way.
6. Be careful that soldering fluxes and acids do not get into the eyes or on the clothing.
7. Never attempt to test a leaking gasoline torch or any gas connections with a lighted match.
8. If clothing becomes ignited, do not run, but lie down and roll over and over, or wrap something around you to smother the flames.
9. Turn off the main current to the battery charge or lamp bank when putting on or removing a battery from the charging line. The gas from a charging battery is explosive and easily ignited from a spark.

[4] Many of the general safety recommendations also apply to the electrical shops and laboratories. Here are listed those recommendations applying only to elctrical shops taken from *Safety Standards and Recommendations for School Shops.* School District of Lancaster, 1934.

10. No open flames should be brought near a freshly charged battery. If lead burning must be done on a battery, have the instructor check over and blow the gas from the battery to guard against an explosion.
11. Never stand over a battery while working on it. An explosion may blind you by thrown acid.
12. Never pour water into strong sulphuric acid while diluting it for electrolyte. Pour the acid into the water slowly.
13. Baking soda is a good neutralizer of battery and other acid, and it may be applied directly to the skin without danger.
14. If you have occasion to work on a battery in a car never work directly under it. The corroded parts or dust would be very injurious if they fell into the eyes.
15. Wear rubber gloves when working around battery acid.
16. Never cut into a wire or open a stitch without guarding against the possibility that a heavy current if flowing might cause a serious burn.
17. Never throw in a switch or insert a fuse until you are SURE the line is clear from one end to the other.
18. When working on a circuit always be sure that the switch is pulled or the fuses are out.
19. Always use a caution tag on any circuit which you may be working on.
20. A student must NOT, under any condition, cause another student to be shocked. Remember that low voltage may be dangerous to certain people.
21. Never cut two wires at the same time. It may burn up your cutting instrument, also cause a severe burn.
22. Do not deliberately short circuit any electrical circuit or generating device. It will cause a bad flash.
23. Never short circuit the terminal of a storage battery. It may explode. Use the proper instruments provided for this purpose.
24. Always test line voltage before inserting any electrical device.
25. Treat all unknown wires as "HOT" wires. Always play safe.
26. Never substitute anything else for a fuse of the proper size. Remember a fuse is a safety valve. This should be demonstrated by the instructor.
27. Do not handle portable electrical tools while you are in a damp or grounded location unless the tool frames are connected to a ground.
28. Electrical appliances such as heaters, toasters, percolators, etc., should NEVER be handled when you are in a damp or grounded location.
29. Do not operate electrical apparatus while holding tools or other conducting apparatus in the hand.
30. Do not use metal rules around electrical equipment.

31. Do not handle anything on the switch board without the permission of the instructor.
32. Never change a circuit on a distribution panel unless you are doubly sure that there is no load on that circuit.
33. When working close to a "HOT" circuit which is exposed, always cover it with a rubber cloth or some other good insulating material.
34. Do not lay or drag lamp cord or wire on a metal pipe or on a sharp edge.
35. Do not forget to shut off the current of a heater, flat-iron or soldering copper when you are through using it or when you want to leave it for a short time.
36. Never watch an electrical arc. The rays will burn the eyes.

Foods[5]

1. *Loose Clothing*

   Make some arrangement by means of which loose clothing will not come in contact with flames.

2. *Oily Mops*

   Oily mops should not be kept in confined places, such as in small closets, metal cans, etc., but should be kept in places where there is adequate ventilation to prevent their ignition by spontaneous combusion.

3. *Pot Handles*

   Be sure that no pot handles project beyond the edge of the stove or table where they might be easily upset and cause severe burns.

4. *Tea Kettle Spouts*

   Be sure that all tea kettle spouts are pointed toward the center of the stove, in order to prevent scalds.

5. *Lighting Gas Appliances*

   When lighting gas appliances of any kind always light the match first and place it near the burner before turning on the gas.

6. *Gas Leaks*

   If an odor of gas is detected at any time do not attempt to locate it with a lighted match or other open flame. Open the windows and doors of the room to secure adequate ventilation and call for the repairman.

[5] Many of the general safety recommendations also apply to the foods laboratories as well. Certain classes in foods are taught as trade classes. All of these recommendations are taken from *Handbook of Safety Regulations*. Board of Education, City of Detroit, 1933.

Forge and Foundry[6]

1. Hardened tool steel should never be struck with hardened tool steel, such as a hammer against the face of an anvil or a hammer against a file.
2. Never harden the end of a chisel or punch on the blunt end.
3. Use goggles in heavy forging.
4. Use only hammers with handles securely fastened.
5. (a) Avoid standing in line with the swing of anyone's hammer.
   (b) Never swing a sledge in line with anyone. First see that you have proper clearance.
6. Be sure tongs are fitted to the work before forging.
7. In cutting off stock or rivets see that no one is in line with the direction in which pieces may fly.
8. Hot metal pieces on the floor should be marked "hot" with chalk so that no one will be badly burned.
9. Keep anvil face clean of scale.
10. When forging be sure to place tongs directly over the work. This will insure safety from flying hot metal.
11. When putting work into or taking it out of the forge be sure to shut off the blast.
12. Do not offer work to be inspected unless you are certain that it is cold.
13. When plunging hot iron into tempering oil stand clear of a possible flare up of oil.
14. Remove all fire hazards such as oil waste or rags which may be in your overalls or near the forge.
15. When case hardening using cyanide, do not breathe the fumes. They are highly poisonous.
16. When using sand to bend tubing be sure that it is absolutely dry.
17. Do not light a gas flame or torch when anyone is standing near the source of the flame.
18. Very serious accidents have resulted from compressed air cleaning hoses. Never touch anyone with the air nozzle. Be careful in blowing down a machine to avoid driving a particle in someone's eyes.
19. Never lay down a burning gas brazing torch. Turn it off immediately.
20. Moisture in molten metal is liable to cause a violent explosion which may cause serious burns or loss of eyes. Do not pour any metal until everything has been inspected by the instructor and only under his immediate supervision.
21. Do not leave gas flames burning or unlit gas turned on.
22. No tanks which have contained gasoline or other explosive liquids are to be soldered, brazed or welded by any pupil.

[6] Many of the general safety recommendations also apply to the forge and foundry shops. All of these recommendations were taken from *Safety Standards and Recommendations for School Shops.* School District of Lancaster, 1934.

23. Never attempt to test leaking gas connection with a flame or lighted match.
24. Crucibles should be inspected by instructor before pouring.

Machine Shop[7]

Engine Lathes

1. Starting a Lathe—If there is any operating knob or lever the operation or function of which is not understood, investigate while the lathe is being slowly turned over by hand. Test all feeds before turning on power.
2. Oiling Lathe—Neither the lathe nor the counter-shaft should be oiled while the machine is in motion.
3. Spindle Turning—In spindle turning, take care that the tail stock is firmly clamped before starting.
4. Setting Tool—For slender pieces, especially of brass or of composition metal, set the cutting tool on center and never above.
5. Stop—Be sure to stop lathe before taking job from center or chucks.
6. Running Gears and Lead Screws—Never touch a running gear and keep clear of a rapidly running lead screw, if it has a longitudinal key way.
7. Throwing in Back Gear—Do not throw in back gear while the machinery is running.
8. Polishing and Filing—When polishing or filing, look out for the lathe dog or any projecting parts of the machine or work. Learn to file left-handed. Use a file provided with a handle.
9. Carriage Lock—Be sure the carriage lock is not set when throwing in the transverse feed.
10. Oiling the Counter-Shaft—Keep the counter-shaft well oiled to prevent the lathe from starting when the clutch is out.
11. Feeds—When using either lead screw or friction feed, be sure the other feed is out.
12. Clamping Nut—When changing to or from back gear, be sure the clamp nut is in place and tightened.
13. Chucking—When chucking work, never leave the wrench in the socket, except when actual adjustment is being made. Serious accidents may result if the wrench is left inadvertently in the socket.
14. Face Plate—Do not put on or remove a chuck or face plate when the spindle is being driven by power.
15. Fastening Chuck—The chuck should always be screwed up firmly against the spindle shoulder so that, if the lathe is reversed, the chuck will not unscrew and fall off, doing possible harm to the operator and the lathe.
16. Reversing Heavy Chucks—A heavy chuck is apt to become unscrewed and fall off if the lathe is not brought to a complete stop before being reversed.

[7] Many of the general safety recommendations also apply to the machine shops as well. All of these recommendations appear in *Handbook of Safety Regulations*. Board of Education, City of Detroit, 1933.

17. Fastening Work—If the work is held in a chuck or on a large face plate, be sure that the work is securely fastened before turning on the power.
18. Balanced Work—Heavy and rapidly revolving pieces should be carefully balanced.
19. Leaving Lathe—When a job is finished, throw out all feeds and do not leave the tail stock offset, or the taper attachment fastened in place.
20. Cleaning Lathe—Take pride in keeping your lathe clean. A good mechanic always leaves his machine wiped clean and in first class order.

Drill Presses

1. Starting a Drill—Before starting a drill press, be sure the table and head are clamped and that the automatic release is set to throw off the feed before the drill can injure the table.
2. Fastening Work—Work should be held by a vise or clamps, and safety stops should be placed in the table, to prevent the work from tearing loose.
3. Feeding of Drills—Feed drill slowly and cautiously, particularly when it is breaking through the piece.
4. Slipping of Drill—If drill slips in the chuck do not attempt to tighten it until the spindle stops. Under no circumstances strike a drill, chuck, or socket with a wrench or steel hammer. Use a lead hammer or a piece of wood.
5. Removing Drill—Always remove a drill or chuck with a drift, and do not allow either to fall.
6. Removing Chips—Use a stick or brush to remove chips from rapidly revolving drills. Never use waste or rags on any drill press operations.
7. Chuck Wrench—Never leave a chuck wrench in a drill chuck.
8. Adjusting Table—Do not raise or lower the table when the drill is in motion.
9. Drill Caught—Do not attempt to stop a revolving piece of work in which the drill is caught. Shut off the power.
10. Drilling Large Holes—In drilling large holes, always clamp work securely to the table and use stops to prevent the work from tearing loose and causing injury.
11. Back Gears—Do not throw in back gears when power is on.
12. Deep Drilling—When the drill has entered work before the flute, withdraw it, and remove the chips frequently.
13. Automatic—Never throw on the automatic feed until the drill is started in the hole.
14. Position in Drilling—In operating drill presses, do not lean over so far that the hair or clothing may be caught in the belt or in a revolving spindle.

Milling Machines

1. Starting a Cut—Make certain that the work is held securely, and that the cutter is properly clamped on the arbor before starting a cut.
2. Arbor Nut—Do not remove or tighten arbor nut by power of the machine.
3. Regulating Cutting Oil—Never reach across a revolving arbor to regulate the flow of the cutting compound.
4. Wiping of Chips—Use a brush on the off side to wipe chips from a revolving cutter. Never use the fingers, waste, rags, or a steel rule for removing chips or oil from any milling machine while it is in motion.
5. Automatic Feed—Be sure automatic stops are set and that everything will run clear during the ENTIRE CUT before throwing in automatic feeds.
6. Back Gears—Stop the machine before throwing in back gears.
7. Cutting Speed—Do not run a cutter at too high a speed.
8. Releasing Feeds—Never leave a machine without releasing all automatic feeds.

Shapers and Planers

1. Clearance—To make sure the tool and head clears the housing and work, turn over the shaper by hand before starting.
2. Setting Vise—When using the vise be sure it is clamped and cannot swivel, before starting a cut.
3. Changing Stroke—After changing length or position of stroke, be sure to tighten the ram.
4. Cutting Stroke—Unless something is wrong, do not shut off the power during a stroke.
5. Feeds—Always feed on the return stroke.
6. Adjusting Tools—Never attempt to adjust or remove a tool while the machine is in motion.
7. Changing Back Gears—Never change the back gears while the machine is running.
8. Position of Operator—Keep your head out of line of the shaper ram.
9. Starting a Planer—Before starting a planer, be sure the work will clear the cross rail and housings and that the platen clears everything at the extreme point of travel.
10. Safety Dogs—Place safety dogs at the end of the planer platen to prevent its running off the ways.
11. Shifting Dogs—Do not shift a dog during a stroke.
12. Planer Table—Never ride on the planer table.
13. Position—Under no circumstances place yourself where you could be caught between the cross-rail, the ram, the housing, and the work. Never place yourself in a position to be caught between the platen and the bed.

14. Leaving Machine—Before leaving the machine throw out all feeds, shift belts on idlers, or gears in neutral position and lock shipper handle.
15. Shipper Handle—If a shipper handle cannot be locked, do not attempt to set up work or repair machine unless power is shut off.

Print Shop[8]

Drives

a. All drives (belt-gear-chain-coupling) shall be guarded in an approved manenr.

Job Press

a. An approved platen guard shall be provided for each press.
b. A flywheel guard of approved type shall be provided for each press.
c. A guard shall protect all exposed shaft ends.

Proof Press

a. If press is of the rack and pinion type, a sheet metal guard shall be provided to prevent fingers from being pinched.

Cutter

a. The proper balance between handle bar and counterweight shall be maintained at all times.
b. A guard shall be placed around the counterweight to prevent toe hazard.
c. Extreme points of knife extending beyond housing shall be guarded.

Note: Suggestions from instructors for the safeguarding of the knife will be welcomed by the Department.

Sheet Metal[9]

a. *Stakes*
   1. Carefulness in handling most important.
   2. Watch out for sharp pointed ends.
   3. Keep clean—and in a definite place.

b. *Solder*
   1. Be careful—it may be hot.
   2. Watch for jagged, pointed ends.

c. *Soldering Flux (Nokorod—acid) (Muriatic)*
   1. Keep away from all other chemicals. In case of breakage the acids should be flushed—neutralized with sodium carbonate.

[8] Many of the general safety recommendations also apply to the print shop as well. All of these recommendations appear in *Safety Requirements for Shops.* Pittsburgh Schools, Pittsburgh, 1933.

[9] Many of the general safety recommendations also apply to the sheet metal as well. All of these recommendations appear in *Safety Standards and Recommendations for School Shops.* School District of Lancaster, 1934.

2. Keep well bottled with tight-fitting cover and in a safe place.
3. Use flux sparingly on all points.
4. Be especially careful not to get flux on hands or body.
5. In cutting muriatic acid with zinc use earthen container or glass jar.

d. *Furnaces*
1. Be sure all fittings are tight.
2. In lighting—first light match, then turn on gas.
3. Be absolutely certain that gas is turned off when finished.
4. Keep hands clear of furnace.
5. Avoid overcrowding near furnaces.

e. *Soldering Copper*
1. Keep in certain, definite place when not in use.
2. Keep hands away.
3. Keep hands well cleaned.
4. Watch out for falling (hot) solder.
5. Never test with hands.
6. Do not carry around in shop.

f. *Electric Soldering Copper*
1. Snap switch carefully when not in use and when finished.
2. Keep close check on cord and watch for torn insulation and breaks.
3. Always disconnect for repairs, etc.

g. *Tinplate, Gal. Iron, Bl. Iron, Wire, Zinc, Copper*
1. Carefulness in handling cannot be overemphasized.
2. Although injuries are usually small cuts they may nevertheless result seriously. Over ninety per cent of the sheet metal accidents are the result of the careless handling of these supplies.
3. Edges and corners are very sharp and one's whole attention should be toward the careful handling of these materials.
4. Watch out for your fellow workman also, lest you should injure him unintentionally in going about your own job.
5. In cutting tin be very careful to eliminate all sliver edges or ragged edges.

Woodworking[10]

a. *Band Saw*
1. Determine the proper cutting procedure and mark with numbered pencil lines before turning on the power.
2. Make all necessary adjustments before starting the saw. Keep the upper guide as close to the stock as convenient.
3. Do not start the cut until the saw has come up to maximum speed, or cut after the power has been shut off.

[10] Many of the general safety recommendations also apply to woodworking as well. All of these recommendations appear in *Safety Standards and Recommendations for School Shops.* School District of Lancaster, 1934.

4. All turns must be made gradually, sudden short twists might cause the saw to break.
5. Never attempt to back out for any great distance. You might pull the blade off the wheels.
6. See your way out before beginning the cut. If backing out is necessary STOP THE MACHINE.
7. When small pieces catch in the table throat, STOP THE MACHINE and notify the instructor.
8. Push scraps away from the table with a stick.
9. Never reach back of saw to pull the material through.
10. Cylinderical stock must never be cut on the band saw. It tends to roll and will break the blade or throw the fingers into the saw.
11. Pupils must not stand at right side of band saw. If the blade should break a serious accident may occur.
12. Learn to cultivate finger tip control of the stock.
13. Tilting the table, or other special set-ups, may be used by special permission only.
14. Do not tamper with upper wheel tilting device.

b. *Tool Grinder*

1. Goggles must be worn by emery wheel operators.
2. Grinding fiber, wood, brass, etc., damages the cutting properties of the wheels and is absolutely forbidden.
3. Steel slivers should be removed at once and FIRST AID applied.
4. Do not hold materials to be ground with pliers. Use a safety holding clamp.
5. Never force so hard as to burn the edge of the tool.
6. Wood cutting tools are ground on the oil wheels, not on the emery stone.
7. Do not tamper with the wheel guard or the grinding rest.
8. Prevent tools from slipping down between the wheel face and the wheel guard. Tools may catch and break the stone.

c. *Jointer*

1. The guard must always be in place and in functioning condition.
2. The pupil shall make no adjustments except under the immediate supervision of the instructor.
3. Watch out for knots and split stock.
4. The stock must be twelve inches or more in length.
5. Always use a pusher for surface jointing.
6. Joint no piece under one inch in width or thickness.
7. END GRAIN may never be run over the jointer.
8. Do not start the cut until the machine has come up to maximum speed, or cut after the power has been turned off.
9. Keep fingers as high as possible on the stock and never drag the thumb at back of board.
10. Do not work against the grain or force the cut too hard.

11. Follow through with the stock and allow the guard to return to the normal closed position.
12. When the fence is moved away from the extreme right side some guard protection must be installed to cover the exposed blades.
13. When blades are installed double check for security before turning on the power.
14. "Kick backs" occur on the jointer when the first table is lowered and the cut is too heavy, also when hard knots are struck.

d. *Wood Lathe*

1. Ask the instructor for the proper speed for each job.
2. Be sure glued work is properly set and solid.
3. All tools must be kept sharp for good safe accurate work. With sharp tools little force will be necessary.
4. Never use the gouge for inside turning.
5. Examine wood for dangerous knots, checks, and splits.
6. Fasten the work securely and check all adjustments.
7. Keep the rest close to the work, stopping frequently to make follow-up and adjustment.
8. Hold the tool firmly in BOTH hands.
9. Stop the lathe for calipering and measuring unless the piece is absolutely round.
10. Do not shut off face platejobs too quickly, they may back off the spindle.
11. Do not slow down the machine by grasping the work, broken fingers have resulted.
12. Beware of polishing rags. The loose ends may catch in the work and be wound up with serious results.

e. *Circular Saw*

1. The saw guard must always be in place in functioning condition. It should never be necessary to remove the guard for any operations; find another way to secure the same results without exposing the pupil to danger.
2. Make all adjustments to machine with the power turned off.
3. Use the ripsaw to cut with the grain and the cross cut across the grain. A combination saw may be used for all cuts in soft woods up to three-fourths of an inch in thickness.
4. Use the ripping fence with the grain and the cross cut gauge across the grain ONLY.
5. Be sure to use the right hand cross cut gauge in the right hand slot and vice versa.
6. Do not raise the saw too high—just so it comes through the wood about one-half inch.
7. A stop block must be used for cutting off lengths, so that several inches of clearance allow the cut off pieces to be removed. Never cut off by stopping against the ripping fence.
8. Ripping without the ripping fence and crosscutting without the crosscut gauge is absolutely forbidden.

9. When ripping, a spreader shall be attached at the rear of the saw table to prevent the stock from binding and therefore being repulsed against the operator.
10. The saw guard shall remain in contact with the material being cut except where the surface might be marred, in which case the guard may be raised SLIGHTLY.
11. A push stick is necessary to feed narrow stock between the saw and the ripping fence.
12. Remove scraps from the saw table with a long stick of wood.
13. When helping to "tail off" never pull on the wood, just support it and allow the operator to feed and guide the stock.
14. All setups, other than straight work, must be checked and approved by the instructor.
15. Careful of "kick backs" and see that others are never standing, or working, directly in line back of the saw.
16. Dado heads are dangerous in that a wider tearing surface is exposed. Extra precautions are necessary to prevent the stock from "riding" back over the saw.
17. Any saw that "wabbles" is dangerous and must not be used.

f. *Surface Planer*

1. Be sure to measure the stock accurately before setting the bed for the first cut.
2. Do not plane under one-fourth inch in thickness. Even a support board is dangerous for planing thin pieces.
3. Stock less than twelve inches in length shall not be run through the thickness planer.
4. Edge planing, where tilting cannot be prevented, is prohibited.
5. Keep hands away from feed rolls and chip escape.
6. When blades are installed, double check for security before the power is turned on.
7. "Kick backs" occur on the planer only when the stock is smaller than the feed roll opening and the board is stuck directly against the revolving cutter head.

Procedure in Case of Accident

Each school district will want to set up its own procedure to be followed in the event of an accident. The city schools of Detroit have set up the following procedure in the case of a serious accident:

1. Give first aid to the injured.
2. Call Receiving Hospital, Cadillac 7305, and arrange to transport the patient to competent medical aid, either by the Receiving Hospital Ambulance, or, in the case of less serious accidents, by the car of a principal or instructor. Receiving Hospital is located at 1300 St. Antoine Street.
3. Notify the child's parents of the accident either by phone or in person and state where the injured has been taken.
4. If the parents desire to arrange for medical care at some place other than the Receiving Hospital, inform them that IT WILL

BE AT THEIR OWN EXPENSE AND LET THEM MAKE THEIR OWN ARRANGEMENTS FOR THE TRANSFER.

5. Notify the School District Safety Engineer by phone immediately.
6. Take every precaution to insure that all machinery, equipment, etc., is left untouched until inspected by the Safety Engineer.

The vocational department of the city schools of Williamsport issue instructions to teachers printed on the outside of an envelope. The instructions follow:

This envelope contains

School accident report blanks in triplicate.
Stamped and addressed envelopes of report to Superintendent.
Emergency bandage for serious injury.

1. Report every accident in which the skin is broken, and send in report IMMEDIATELY.
2. Apply at office for additional reports, envelopes, and bandages before your present supply is exhausted.
3. Accidents are NOT to be treated by shop teachers.
4. In all cases of reported accidents, the student should be sent to the school office for treatment, unless in the opinion of the shop teacher, or office secretary, immediate surgical aid is required.
5. In such serious accidents, the shop teacher, or office secretary, should take or send the student to the Williamsport Hospital Emergency Ward, or to the family physician.
6. The emergency bandage is for the purpose of stopping excessive bleeding until surgical aid is obtained, and is not to be used for slight cuts. This emergency bandage is aceptic, and is sealed to prevent the entrance of foreign substances. Do not open until needed, and destroy unused portion. Read the directions on the bandage.
7. The school district is not to be held responsible for the payment of hospital and doctor bills. These bills should be sent to the parents.
8. I have read the above instructions and understand them.

.....

Signature of Teacher

The report form[11] used in this study may be used by districts in reporting accident injuries. During the next few years attempts should be made to have a unified accident reporting system.

First Aid[12]

Equipment

Each shop or group of shops should be equipped with first aid cabinets used exclusively as containers for all first aid materials. These supplies should be kept meticulously clean and free from dust. Each cabinet should contain:

[11] See form on pages 39 to 43 inclusive.

[12] Instruction regarding "First Aid to the Injured" may be found in National Socety for the Study of Education, "The Present Status of Safety Education." *Part I, Twenty-fifth Yearbook.* Bloomington: Public School Publishing Company, 1926, p. 47.

1 bottle of aromatic spirits of ammonia
1 roll of absorbent cotton
1 spool of adhesive tape
1 roll of 2-inch bandage
1 jar of vaseline
1 bottle of mercurichrome

Instruction in First Aid

The nurse, teacher, safety engineer or member of a first aid team should be well informed regarding administering first aid to the injured. They need to remember that first aid is an emergency treatment only. This service is rendered to the injured to reduce the danger until competent medical care can be provided. Seek the aid of experts as doctor, nurse, etc., as soon as possible following an accident.

In case of cuts, it is usually wise to bandage wounds temporarily until the assistance of a physician can be secured. If unduly delayed flush the direct cut of a wound. Use gauze or clean handkerchief to stop excessive bleeding.

In each school and shop, persons should be designated as being responsible for administering first aid in case of an emergency.

Keeping Accident Records

A very large number of the accident studies and, in fact, most of the safety literature, states that keeping accident records forms the basis of safety work.

Each school district could set up its own plan for keeping accident records. The safety movement could be further advanced if there could be an agreement regarding the method of keeping accident records in all school systems.

Every district should keep continuous record of all accident injuries for study and comparison within the school system. Later school systems will want to compare their success in eliminating accidents with others. This may well be fostered through convention program discussions. Later a state-wide unified system will be wanted to meet the situation more adequately.

An honest basis of comparison will require the establishing of certain units of measurement not generally familiar to industrial teachers as yet. In industry frequency rate and severity rate are used as index terms for comparison. These terms have the following meaning in industry:

FREQUENCY RATE = Lost time accidents per million man hours worked.

SEVERITY RATE = Number of days lost per thousand man hours worked.

In school shops these same terms could be interpreted thus:

FREQUENCY RATE = The number of accidents per million student hours exposed.

SEVERITY RATE = The number of hours lost per thousand student hours exposed.

There are relatively few accident injuries necessitating days lost. The days lost could be multiplied by the number of hours in a school day and thus reduce all lost time to an hourly basis.

Severity of injury could well be divided into the following headings:

COMMON—Did not require first aid.

MINOR—Required first aid treatment only.

SEVERE—Medical aid, stitches, or setting bones, etc.

SERIOUS—Lost use of a member of the body.

CRITICAL—May cause death.

DEATH—Accident resulted in death.

In any accident record system it is important that forms used for collecting the data are simple, clear, and tend toward a proper reporting of the situation.

As an illustration, a case was reported where the cause of the accident was given as carelessness. The description of the accident indicated the boy was leaning on machine. A further study shortly after revealed that the young man had worked until 3 A. M. the night before the accident. Lack of proper rest might have been a more correct cause.

Safety Organization

In several large cities, notably Pittsburgh, Williamsport, and Detroit, plans for carrying on safety programs in the school shops call for the appointment of a student in each class to be in charge of safety for the time the class is in shop. This is in line with the school boy patrol plan which is functioning successfully on the schoolground and at street crossings.

An attempt is made in these school systems, to give as large a number of boys as possible the experience of being in charge of safety. In some few schools the students in charge of safety serve for a week or a month. Student safety engineers hold safety meetings to discuss their common safety problems.

Duties of the Safety Engineer[13]

1. See that all neckties are removed or tucked in.
2. See that sleeves are rolled up.
3. See that aprons are worn, whenever possible.
4. See that goggles are worn at the grinder.
5. See that goggles are worn at the furnace when molten metal is being poured.
6. Keep all flames inside the furnaces.

[13] This list of duties is reprinted from *Safety Education in the School Shop*, Bulletin No. 226, which was prepared by Hugh McKinnon, machine-shop instructor, Miller Intermediate School, Detroit, and Gordon Graham, safety engineer, Detroit Board of Education.

7. Supervise lighting the furnace.
8. Set the toolrest on the grinder.
9. See that tools are kept off the floor.
10. See that oil is wiped off the floor.
11. See that oily rags are placed in the covered metal container.
12. See that there are no mushroomed tools used.
13. See that no files are used without handles.
14. Inspect the first-aid cabinet.
15. See that all cuts are properly dressed.
16. Prevent "horseplay" in the shop.
17. See that finger rings are removed.
18. See that crib boy does not give out any defective tools.
19. See that no safety guards are removed from machines.
20. See that no pieces of hot steel are left lying about unmarked.
21. See that a machine operator does not walk away from his machine while it is running.
22. See that belts on the countershaft are shifted with the belt stick.
23. See that lathes are stopped before shifting the belts on the spindle cones.
24. See that no rags are used around the machine while the main power switch is on.
25. See that work on the drill press is held in a vise or firmly clamped.
26. See that boys do not stand directly in front of the grinding wheel.
27. See that every machine is released before throwing on the main power switch.
28. Report any infractions of the "Safety Rules and Regulations," or any other unsafe practices that come to his attention.
29. Report all accidents to the instructor and make out accident reports to be handed to the instructor.
30. In his notebook, the safety engineer shall tell each day what he did to prevent accidents.

Check lists containing duties of the safety engineer are used effectively in a number of schools.

First Aid Team

Industry has found the formation of first aid teams most successful. Keen interest and friendly competition has been created between teams in training when they demonstrate their abilities at "Safety Meets."

Local industries would gladly cooperate with the schools in the training of first aid teams for the school shops.

These teams should be so organized that boys would be trained and available to conduct first aid work in each school shop.

This instruction should cover bandaging for cuts, fractures, burns, shock, and asphyxiation.

Best Record Trophy

It would be well for schools to arrange for the awarding of a trophy to the group of students maintaining the Best Safety Record. Probably some industry or organization in the community might furnish the trophy to be awarded.

Students in art metal or sheet metal also might make the trophy.

If trophies are not available or considered desirable, then some public acknowledgment should be made in assembly or bulletin board. This will tend to motivate the safety program.

Safety Instruction

Subject-matter. There is such a wealth of safety material available as may be seen by reviewing the "Selected Bibliography." The last three chapters in this study furnish the basis for suitable subject-matter. Subject-matter outlines appear in any magazine issues and also in books dealing with safety.

Method of Teaching Safety. Safety should be taught from a positive approach pointing out first the right way of doing things and stressing this point. Dangers should also be pointed out so that students are aware of hazards and results from wrong ways of work.

There are those who believe all safety should be taught as related class work and definite time should be scheduled for safety instruction. There are others who believe all school shop safety should be taught by the teacher in the shop. The shop and the related-subjects teachers both have their contribution to make and undoubtedly should participate in safety instruction. Many subjects lend themselves to the teaching of safety and all should be utilized. A coordination of this instruction can be worked out between shop and related subjects teachers.

The demonstration method is commonly used by shop teachers. A number of the larger school districts have found it profitable to stage safety demonstration lessons at teachers' gatherings as a means of improving methods of teaching safety.

A student safety organization can be made an effective means of checking up and improving safety practices. A good time to teach a subject is when the students are conscious of the need. Thus safety should be taught just before the students need to know or as near as possible to the time when they need to know.

Posters, lectures, slides, films, and demonstrations have all been used effectively to teach safety. Recently schools are insisting on safety tests with one hundred per cent as the passing grade. The following is an illustration of one of a number of different safety tests used in Lancaster Public Schools:

Safety Test in Wood Working
The Jointer

No pupil will be allowed to operate the jointer until he has passed the machine operator's test in jointer operation and has made a score of one hundred per cent.

Name ..... School .....

Score .....% Date ..... Class .....

Has parent's permission card been received? .....

1. Machines should not be ..... in the absence of the instructor.
2. .... may never be run over the jointer.
3. Inspect lumber for .... before jointing.
4. Always use a ..... for surface joining.
5. Stock must be over ..... inches in width, and ..... inches in length for safe joining.
6. All jointer adjustments will be made by .....
7. Do not ..... until the jointer has reached ..... speed.
8. When leaving a machine .... the .....

Summary

The known tested satisfactory methods of dealing with safety should be employed until better methods have been discovered. Everyone concerned ought to study safety hazards with a view of providing improvement in practice.

Dangers and hazards must be pointed out to students in order that they may protect themselves from the same.

Safety should be taught from a positive approach—or the right way of doing things should be stressed.

Teachers and students should be informed and trained in what to do in case of an accident.

School shops should be equipped with a complete sanitary safety cabinet.

Records of accidents should be carefully prepared and then tabulated as a basis for future safety study.

Student safety engineer organization is advocated for all school shops.

Both shop and related subject teachers should cooperate in teaching safety.

To provide the next generation with safe-workers in industry, we must train students in school shops to work and think safety. This will mean that teachers will need to teach and practice safety.

Directors of industrial education will need to lead in setting up and administering an effective safety program.

Those engaged in teacher-preparation have an opportunity and a responsibility to lead all others in safety education resulting ultimately in producing safe workers all along the line.

Let us all unite in eliminating accidents and in producing workers with a positive safety attitude.

The best known safety device is a careful worker.

EXHIBIT

Hollerith Card Used for Tabulation

Questionnaire Checked in Advance for Tabulation

To illustrate:

27 Shop
00 Art metal
01 Automotive
02 Beauty culture
03 Brick laying
04 Commercial art
05 Cooking
06 Drafting
07 Electrical
08 Forging
09 Foundry
10 General
11 Machine
12 Millinery
13 Painting
14 Pattern making
15 Plumbing
16 Printing
17 Power operating
18 Sewing
19 Sheetmetal
20 Tailoring
21 Textiles
22 Welding
23 Woodworking
24 .....

These numbers appearing before each subject, as "27 Shop" referred to the place provided in the Hollerith tabulating card for tabulation purposes. This was also true of the numbers before the name of the shop. Thus a circle around "01 Automotive" not only provided the information as to the shop in which the accident occurred, but also furnished the code number for tabulation purposes. The distribution of subjects on the tabulation card appears on pages 39 and 40.

This point might be greatly amplified as will be readily noticed. Particularly the list of "What was responsible for the accident?" was developed from a study of the frequency of these possible replies referred to in safety literature. Where there was a possibility of an additional reply other than those listed, space was provided for such replies.

Hollerith Tabulating Card

Identification Number				Description of Accident		Description of Injury		First Aid	Hospital	Treatment	Parent Notified	Shop Crowded	Sufficient Equipment	Illumination	Glare	Name of Tool or Machine	Guards Equipped	Guards in Use	Housekeeping	Instruction in Shop	Permission
0				0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0
1				1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	1
2				2		2		2	2	2	2	2	2	2	2	2	2	2	2	2	2
3				3		3		3	3	3	3	3	3	3	3	3	3	3	3	3	3
4				4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4
5				5		5		5	5	5	5	5	5	5	5	5	5	5	5	5	5
6				6		6		6	6	6	6	6	6	6	6	6	6	6	6	6	6
7				7		7		7	7	7	7	7	7	7	7	7	7	7	7	7	7
8				8		8		8	8	8	8	8	8	8	8	8	8	8	8	8	8
9				9		9		9	9	9	9	9	9	9	9	9	9	9	9	9	9
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Hollerith Tabulating Card (Continued)

Pupil Instructed	School	Grade	Shop	Safety Engineer	Size Class	Age	Month	Day	Hour of Day	Hours	Days Lost	Months	Semesters	Severity	Who Responsible	What was responsible
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45

School District .....

Name of School .....

Date .....

Commonwealth of Pennsylvania
DEPARTMENT OF PUBLIC INSTRUCTION
Harrisburg

The Education Bureau
Division of Industrial Education

INDUSTRIAL SCHOOL ACCIDENT INJURY REPORT

Name .... Address .....
Last First Initials

5. Description of the Accident .....

.....

7. Description of the Injury .....

.....

Place a circle around the right number opposite the word, words or figure representing the correct information as "(1) Yes." If words and figures are inadequate, supply the information on the blank line. See "Suggestions for Reporting Industrial School Accident Injuries."

9. Was first aid given? 1. YES 2. NO If so, by whom?.....

10. Was pupil taken to hospital? 1. YES 2. NO If so, by whom?.....

11. Was hospital treatment given? 1. YES 2. NO Doctor?.....

12. Was parent notified of injury? 1. YES 2. NO If so, by whom?.....

13. Was the shop crowded? 1. YES 2. NO

14. Was there sufficient equipment? 1. YES 2. NO

15. Was adequate illumination provided? 1. YES 2. NO

16. Did glare exist? 1. YES 2. NO

17. Name of tool or machine on which accident occurred.....

19. Was the machine tool equipped with approved safety guards? 1. YES 2. NO

20. Were the guards in use? 1. YES 2. NO

21. Was there good housekeeping? 1. YES 2. NO

22. Was the instructor in the shop when the accident occurred? 1. YES 2. NO

23. If accident happened on a power driven machine tool, had permission been granted by parent or guardian to operate the same? 1. YES 2. NO 3. Not required by school

24. Had this pupil been properly instructed about the hazards involved in this particular situation which caused the accident? 1. YES 2. NO

25. School
0—Elementary school
1—Junior high school
2—Senior high school
3—Trade school
4—Evening school
5—Special school
6—.....

26. Grade
0—1-6
1—7
2—8
3—9
4—10
5—11
6—12
7—Post graduates
8—Trade extension
9—Ungraded

27. Shop
00—Art metal
01—Automotive
02—Beauty culture
03—Brick laying
04—Commercial art
05—Cooking
06—Drafting
07—Electrical
08—Forging
09—Foundry
10—General
11—Machine
12—Millinery
13—Painting
14—Pattern making
15—Plumbing
16—Printing
17—Power operating
18—Sewing
19—Sheetmetal
20—Tailoring
21—Textiles
22—Welding
23—Woodworking
24—.....

30. Size class
.....

32. Age
.....

34. Month
0—September
1—October
2—November
3—December
4—January
5—February
6—March
7—April
8—May
9—June

35. Day
0—Monday
1—Tuesday

2—Wednesday
3—Thursday
4—Friday
5—Saturday

36. Hour
00—8 A.M.
01—9 A.M.
02—10 A.M.
03—11 A.M.
04—12 M.
05—1 P.M.
06—2 P.M.
07—3 P.M.
08—4 P.M.
09—5 P.M.
10—6 P.M.
11—7 P.M.
12—8 P.M.
13—9 P.M.

Time lost

38. .....hours

39. .....days

40. .....month

41. Number of semesters in this shop
.....

42. Severity of accident injury
0—Common—did not require first aid
1—Minor—required first aid treatment only
2—Severe—medical aid—stitches or setting bones, etc.
3—Serious—lost use of member of the body
4—Critical—may cause death
5—Death—occurred as result of accident

43. Who was responsible for the accident?

0—Student injured
1—Other students
2—Teachers
3—Director of Indus. Ed.
4—Supt. of schools
5—School board
6—Visitors
7—.....

44. What was responsible for the accident?

00—Lack of instruction
01—Lack of supervision
02—Failure to carry out instruction
03—Improper position of body, hands, etc.
04—Hasty work
05—Inattentiveness
06—Poor health
07—Worry
08—Anger
09—Horse play
10—Inadequate light
11—Glaring light
12—Falls
13—Slippery floors
14—Poor housekeeping
15—Struck by objects
16—Loose clothing
17—Handling materials
18—Dull tools
19—Defective tools or equipment
20—Misuse of tools or equipment
21—Stock held insecurely
22—Stock too short
23—Feeding stock too fast
24—Adjusting guards while machine was running
25—Reaching in rear of saw to guide stock
26—Improper speed of machine

27—Guards not used
28—Lack of proper guards
29—Obsolete equipment
30—Failure to wear goggles
31—Not enough equipment to give each student a working location
32—.....
33—.....

.....
Student Safety Engineer

.....
Instructor

.....
Supervisor, Director or Principal

The Instruction Sheet

An instruction sheet, a copy of which appears on pages 43 and 44 was sent to each school shop instructor cooperation in this study. These instruction sheets were planned to explain in detail the proper use of the accident report forms.

Suggestions for Reporting Industrial School Accident Injuries

1. School districts having trade and industrial arts work are invited to cooperate in this study for the purpose of discovering the nature and causes of school shop accident injuries.
2. The study should be as extensive as possible so that a true picture of the situation in Pennsylvania may be secured.
3. Districts willing to cooperate in this study should notify the Department of Public Instruction so that mailing lists can be compiled.
4. The study is to cover this entire school year from September to the closing of school in May or June.
5. Reports of accident injuries should be sent in during the year—preferably January 1, April 1, and end of school year.
6. Additional industrial school accident injury report blanks will be sent upon application.
7. The report blank is set up in such form as to reduce the work of "filling in" a report, to the minimum, and also to be tabulated on Hollerith Tabulation Cards.
8. Districts are invited to send in successful safety prevention suggestions. Photographs of safety devices will be useful.
9. Figure the total number of hours all the students spent in the shops during the year in order that we can calculate the exposures per injury. This will give more nearly a true index figure of the hazard. This should be tabulated at the end of the school year by

   Elementary school .....Student shop hours exposure
   Junior high school .....Student shop hours exposure
   Senior high school .....Student shop hours exposure
   Trade school .....Student shop hours exposure
   Evening school .....Student shop hours exposure
   Special school .....Student shop hours exposure

10. In the industrial school accident report blank the numbers used beginning with 5 refer to a certain item of information and also a certain space on the Hollerith Tabulation Card. Further explanation is offered here to clarify the information desired for several of these items.
    Leave items blank if they do not apply.

9 to 24. Answers to most of these questions should be Yes or No.

13. Answer Yes or No. A minimum of at least 40 square feet per student is usually needed in an average shop. There are other factors in "crowded" conditions beside floor space which may be considered.

14. Equipment adequate to provide each student in the class with a working location.

15. Conforms to "American Standard Codes of Lighting School Buildings," United States Department of Labor, No. 382 from Superintendent of Documents, 10c a copy. "Regulations for Industrial Lighting," Department of Labor and Industry, Harrisburg, Pa.

19. The machine where the injury occurred was guarded with approved guards in accordance with regulations in the State Department of Labor and Industry.

20. The guards were or were not used when the accident injury occurred.

21. Clean, orderly, in place, system.

25 to 44. Place a circle around the right number opposite the proper answer as, ①—Junior high school. If the name of the type school does not appear, place it in—⑥—with name written in, etc.

30. Size of the class present in the room where the accident occurred.

32. Give age by year only as 14, etc.

36. The time between 7:30 A.M. and 8:30 A.M. should be reported as 8:00 A.M., etc.

41. How many semesters was the boy in this shop or type of work as electricity, printing, etc. when the accident occurred?

42. Every accident injury is reportable under these six degrees of severity.

43. Be as fair as possible in your judgment and conclusion as to who was responsible. Let the final decision rest with the supervisor, director, or principal.

44. Place circles around several of these or other causes if more than one cause conributed to the accident.
Additional causes may be written in lines 32 and 33 if desired.

Let each class have some one who is assigned as student safety engineer who will check up to see that students work safely, and assist in all safety measures.

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"Affecting Employment of Women."
"Bakeries."
"Boilers."
"Canneries."
"Compressed Air Apparatus."
"Construction and Repairs."
"Cranes and Hoists."
"Dry Color Industry."
"Elevators, Escalators, Dumbwaiters, and Hoists."
"Electric Safety."
"Foundries."
"Grandstands."
"Head and Eye Protection."
"Industrial Home Work."
"Industrial Lighting."
"Industrial Sanitation."
"Labor Camps."
"Ladders."
"Laundries."
"Lead Corroding and Lead Oxidizing."
"Logging, Sawmill, Woodworking, Veneer, and Cooperage Operations."
"Machine Tools."
"Mechanical Power Transmission Apparatus."
"Miscellaneous Hazards and Conditions of Employment."
"Plant Railways."
"Power, Foot and Hand Cold Metal Presses."
"Printing and Allied Industries."

Protection from Fire and Panic

"Class I Buildings"
"ClassII Buildings"
"Class III Buildings"
"Class IV Buildings"
"Fireproofing"
"Construction, Installation and Maintenance of Emergency Lighting Systems"
"Construction, Installation and Operation of Fire Alarm Systems"
"Operation of Motion Picture Projectors"
"Storage and Handling of Photographic and X-ray Mitrocellulose Film"
"Specifications for Standard Fire Escapes"

"Railings, Toe Boards, Open-sided Floors, Platforms, and Runways."
"Safe Practice Recommendations."
"Spray Coating."
"Stationary Engines."
"Textile Industries."
"Trenches and Excavations."
"Tunnel Construction and Work in Compressed Air."
"Window Cleaning."

[1] Department of Labor and Industry, Harirsburg, Pa.

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"Artificial Respiration, Prone Pressure Method."
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Fire Prevention School

"Fire Extinguishing"
"Fire Prevention—Special Hazards"
"Fire Prevention—General Hazards"

Home Safety Lessons

"House We Live In"
"Outguessing the Child"
"Electricity and Gas—Their Use and Abuse"
"Flaming America"
"When Accidents Occur"
"Accidents a Community Problem"

You and Your Car

"Rules of the Road"
"Mechanical Equipment"
"The Motorist and the Pedestrian"
"Automobiles and Railroads"
"Garage Accident Hazards"
"Safe and Efficient Driving"

Safe Practices Pamphlets

"Acids and Caustics," *Bulletin No. 25*
"Belt Shifters and Belt Slippers," *Bulletin No. 5*
"Belts and Belt Guards," *Bulletin No. 7*
"Caring for Injured Workers," *Bulletin No. 82*
"Construction of Machinery Guards," *Bulletin No. 58*
"Electrical Equipment in Industrial Plants," *Bulletin No. 29*
"Engine Guarding and Engine Stops," *Bulletin No. 9*
"Exhaust Systems," *Bulletin No. 32*

[2] National Safety Council, 20 N. Wacker Drive, Chicago, Illinois.

"Fire Causes and Prevention," *Bulletin No. 31*
"Fire Extinguishment," *Bulletin No. 24*
"Floors and Flooring," *Bulletin No. 11*
"Gas and Electric Welding," *Bulletin No. 23*
"Goggles," *Bulletin No. 14*
"Grinding Wheels," *Bulletin No. 13*
"Hand Tools," *Bulletin No. 41*
"Hoisting Apparatus," *Bulletin No. 33*
"Industrial Accident Statistics—How to Collect and Tabulate Them," *Bulletin No. 21*
"Industrial Housekeeping," *Bulletin No. 45*
"Knots, Bends, Hitchens, and Slings," *Bulletin No. 6*
"Ladders," *Bulletin No. 1*
"Machine Shop Machinery," *Bulletin No. 39*
"Maintenance and Repair Men," *Bulletin No. 70*
"Motion Pictures in Educational Work," *Bulletin No. 62*
"Oiling Devices and Oilers," *Bulletin No. 10*
"Power Presses," *Bulletin No. 18*
"Protective Clothing," *Bulletin No. 16*
"Safe Practices in Forging and Hot Metal Stamping," *Bulletin No. 85*
"Scaffolds," *Bulletin No. 12*
"Shafting, Couplings, Pulleys, Gears, Sprockets, and Chains," *Bulletin No. 8*
"Stairs and Stairways," *Bulletin No. 2*
"Teaching Safety to New Employees," *Bulletin No. 65*
"Training for First Aid," *Bulletin No. 83*
"Warning Signs—Their Use and Maintenance," *Bulletin No. 81*
"Woodworking Machinery and Equipment," *Bulletin No. 20*

United States Department of Labor

"Accidents and Accident Prevention in Machine Building," *Bulletin No. 256*
"Industrial Accidents to Men and Women," *Bulletin No. 81*
"Occupation Hazards and Diagnostic Signs," *Bulletin No. 306*
"Record of Industrial Accidents in U. S. to 1925," *Bulletin No. 425*
"Standardization of Industrial Accident Statistics," *Bulletin No. 276*
"Statistics of Industrial Accidents in U. S. to End of 1927," *Bulletin No. 490*

The National Safety Council publishes a large list of pamphlets on Safety. Only a few of their publications applying most directly are listed here. Insurance companies and the large industrial concerns quite generally publish Safety pamphlets.